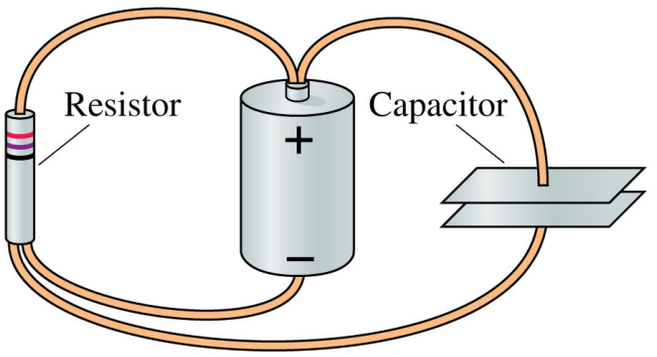
Chapter 31

Fundamentals of Circuits

(*Circuit Elements and Diagrams & Kirchoff's Laws and the Basic Circuit*)

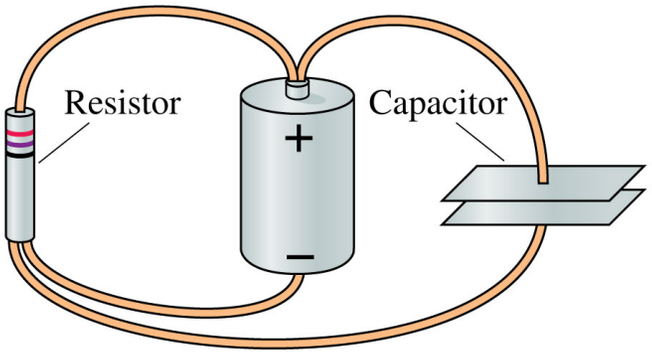
31.1:
Circuit Elements and Diagrams

Simple circuit of a resistor and a capacitor connected by wires to a battery.

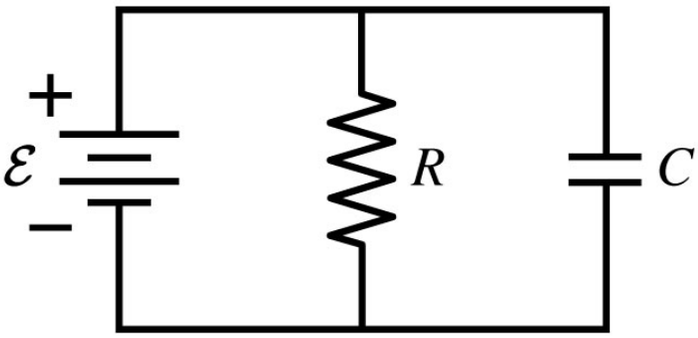


31.1: Circuit Elements and Diagrams

Simple circuit of a resistor and a capacitor connected by wires to a battery.

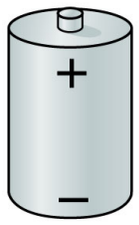


Equivalent circuit diagram



31.1: Circuit Elements and Diagrams

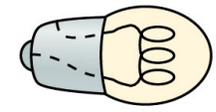
Circuit elements with equivalent symbols..



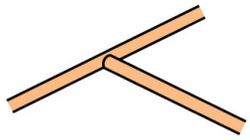
Battery

Wire

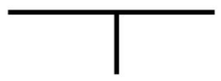
Resistor



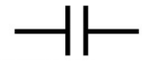
Bulb

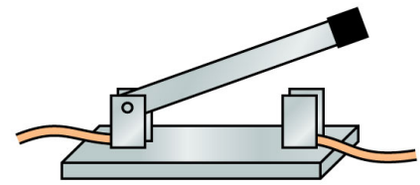


Junction



Capacitor



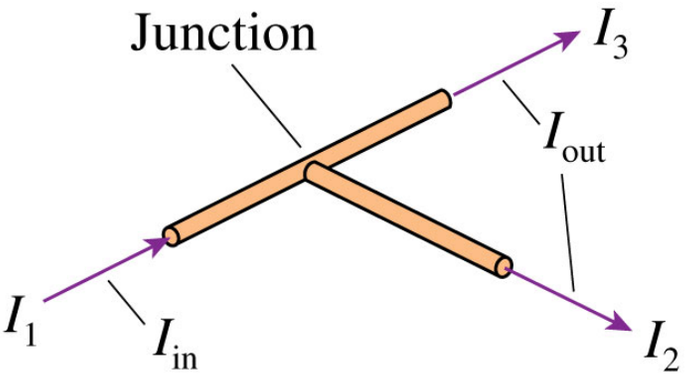


Switch

31.2: Kirchoff's Laws and the Basic Circuit

For a circuit junction, *Kirchoff's Junction rule* holds…

$$\sum I_{in} = \sum I_{out}$$

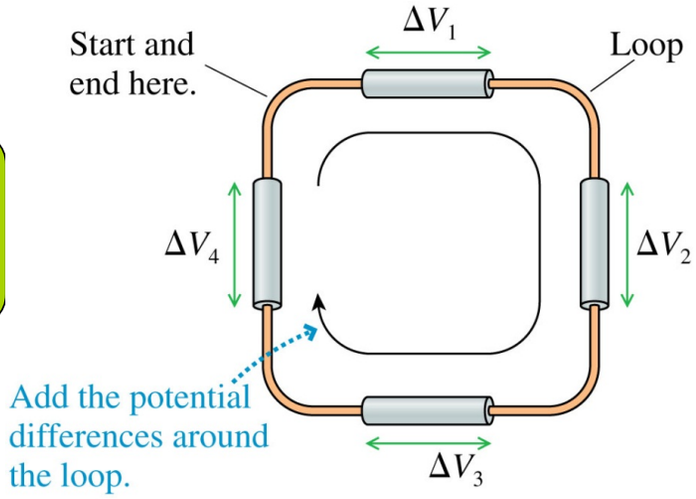


Junction law: $I_1 = I_2 + I_3$

31.2: Kirchoff's Laws and the Basic Circuit

For a circuit, *Kirchoff's Loop rule* holds…

$$\Delta V_{loop} = \sum (\Delta V)_i = 0$$



Loop law: $\Delta V_1 + \Delta V_2 + \Delta V_3 + \Delta V_4 = 0$

31.2: Kirchoff's Laws and the Basic Circuit

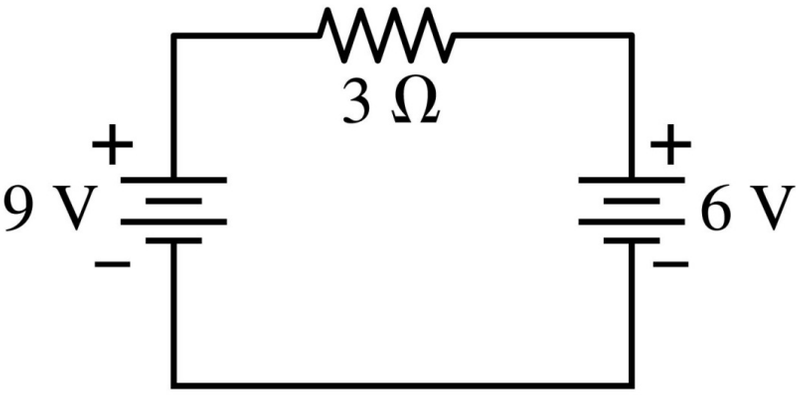
Using *Kirchoff's loop law*...

1. Draw a circuit diagram, labeling quantities.
2. Assign a direction to the current.
3. "Travel" around the loop.
4. Apply the loop law:

$$\sum (\Delta V)_i = 0$$

Quiz Question 1

The current through the 3 Ω resistor is



1. 9 A.
2. 6 A.
3. 5 A.
4. 3 A.
5. 1 A.

i.e. 31.1:
Two resistors and two batteries

Analyze the circuit shown in the figure.

a. Find the current in and the potential difference across each resistor.

b. Draw a graph showing how the potential changes around the circuit, starting from $V = 0$V at the negative terminal of the 6 V battery.